Research-oriented model of cognitive learning in the subject of Technique

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Abstract

This article focuses on the research-oriented model of student education in the subject of Technique in lower secondary education in the Slovak Republic. The proposed model reflects the long-term educational needs in the subject of Technique, which, despite updates to the curriculum in the Educational Standard of the subject, have yet to be fully addressed. The learning model includes worksheets for students that feature experiments, along with a methodology for carrying out each experiment. Students discover new knowledge through research activities during the experiment, which they then evaluate at the end of the worksheet. The worksheet also includes a self-assessment sheet, where students record their responses to the experiment, reflect on their understanding of the content, and assess their satisfaction with their performance.

The article also presents the results of empirical research aimed at verifying the proposed research-oriented model. This research is part of the KEGA project No. 006UMB-4/2022, conducted in 2022.

Keywords: Primary School, Subject Technique, Model of Education

1 Introduction

The school reform of primary schools in Slovakia, implemented in 2008 and modified in 2013, has not met expectations, as the set objectives have not been achieved in various subjects, including Technique in lower secondary education. This is one of the reasons why a new curriculum reform, set to be implemented from the first year in all primary schools starting in 2026, is being tested in selected schools beginning in the 2023-2024 school year.

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The main objective of the reform is to educate students in the key competencies of the 21st century (creativity and innovation, creative and critical thinking, problem-solving, etc.). This requires teachers to adapt their teaching approach, shifting towards a research-oriented model of learning, as well as adjusting how they assess students' performance.

2 Starting points of the problem addressed

The subject of Technique has a specific place in the system of teaching subjects in lower secondary education in Slovakia and it is not replaceable by any other subject. It is focused on forming, acquiring and developing students' key competences. The traditional and most widely used approach to assessing student performance, focused on classification and marking (summative assessment), prevails in the subject even today. Since one of the objectives of the current curriculum reform is to transform the traditional school into a modern school, the application of formative assessment and student self-assessment is coming to the fore. In this type of assessment, the student is more active, receives feedback on the correctness of his/her learning, and his/her performance is not classified but verbally evaluated by the teacher.

From a didactic perspective, self-assessment can be viewed as a competence that promotes self-reliance and independence from the teacher. Both self-assessment and self-checking are important motivational tools for students. As stated by several authors (Ďuriš & Stadtrucker, 2016; Ďuriš et.al, 2017; Ďuriš et.al, 2018; Ďuriš, Stadtrucker & Pandurović (2019); Koedinger, McLaughlin & Hefferman, 2010; Ďuriš & Kvasnová, 2022; Ďuriš et.al, 2023; Ďuriš, Očkajová & Kvasnová (2023); Ďuriš, Tomková & Kvasnová, 2024), formative assessment of students should be used more extensively, as it improves the quality of students' knowledge and skills. More information about formative assessment of students can be found in the publication of the authors (Ďuriš, Stadtrucker & Pandurović, 2019).

A part of the research-oriented model of education in the subject of Technique is our workbook, which includes exemplification tasks. The worksheets in the workbook contain tasks designed to encourage students' exploratory activities. The tasks, which focus on the properties of technical materials (wood, metals, plastics), align with the content of the thematic unit "Technical Materials and Methods of Their Processing," taught in the 6th year of primary school. The properties of these materials can be observed directly or explored through simple experiments. Based on experiments carried out by the students themselves, they can more easily understand the phenomena observed and explain and justify the changes that occurred during the experiment. At the end of each experiment, students carry out a self-assessment and self-check as part of the formative assessment. They answer the prepared questions in their own words and express in writing their opinion about the experiment, how they understood the given topic and how they managed to work out the task in the experiment (Ďuriš et.al, 2023, p. 9).

Each worksheet is designed with the same structure but features different content. It includes the name and aim of the experiment, the task, tools, and the procedure for carrying out the experiment. The worksheet also contains a table in which the student records data while solving the problem, which is then analysed and evaluated in the following steps. In the final part of the worksheet, there are questions formulated within the self-assessment record sheet for the student to answer. The record sheet also includes a suggested table, where the student marks one of the emoticons (x) in each row based on how well they understood the task and how much they enjoyed the experiment. The student expresses their level of satisfaction with their performance using one of the three offered options: ☺ very well, 😐 good and ☹ I need to improve.

In individual experiments, the content of text in the self- assessment record sheet varies according to the type of experiment. However, they all have a uniform introductory wording, so that the student is able to express a level of agreement with following statements:

- I know the reason why ....,
- I can name the feature ....,
- I understood how ....,
- I understood the given task, the experiment was illustrative, and I found it interesting.

The workbook contains 17 worksheets. In empirical research carried out in fully organised primary schools in Slovakia, students in the 6th year of primary school solved ten worksheets focused on a specific property of a given material. We present the worksheets completed by students in the research.

Worksheet nr. 2 (elasticity of wood); Worksheet nr. 3 (hardness of wood); Worksheets nr. 4 and 5 (water absorption capacity of wood); Worksheet nr. 7 (density of wood); Worksheet nr. 8 (electrical conductivity of metals); Worksheet nr. 11 (magnetic properties of metals); Worksheet nr. 12 (elasticity of metals); Worksheet nr. 13 (corrosion of metals); Worksheet nr. 17 (weldability of plastics). To give the reader a better idea, we present an excerpt of the full version of Worksheet nr. 4 (Ďuriš et.al, 2023, pg. 26-28).

The worksheet nr. 4

The water absorption capacity of wood is the ability of wood to absorb water, when it is in contact with water, not water vapour. A practical use of this property is when we need the wood to increase its volume (e.g. immersing a hoe, rake or axe handle in the water), so that the wooden handle absorbs the water and increases its volume.

To protect the wood from unwanted water absorption, we paint the wood located outdoor in the

Experiment nr. 4 Water absorption capacity of wood

The aim is to determine the water absorption of soft wood and hard wood and to compare them with each other.

Task:

On selected soft wood and hard wood samples determine the degree, to which the wood is saturated with water, provided that both soft wood and hard wood samples are immersed with their entire volume in water for the same time.

Tools:

- soft wood sample (spruce, pine or fir), hard wood sample (beech or oak) of dimensions 40x40x100 mm,
- digital or laboratory scales, set of weights,
- tub - water container, water thermometer,
- stopwatch for time measurement,
- water at 25° C – 30° C, textile (paper) cloth.

Work procedure

1. Using digital scales, determine the weight of soft wood and hard wood samples and enter the values in the table.
2. Immerse a soft wood and hard wood sample in a tub of water at the same time and use a weight for each sample (set of weights) so that they are completely immersed in the water and do not float.
3. Leave the wood samples immersed in water for 20 minutes.
4. After a given time, remove both samples from the water, dry them with a cloth, find the weight of the soft wood and hard wood samples and enter the values in the table.

Complete the collected data in the table.

Sample of wood	Weight of the sample *[g]*		Difference in weights *[g]*
	Beginning of the experiment	End of the experiment	
spruce (soft)			
beech (hard)			
altern. oak (hard)			

Explain in your own words, what caused each sample to change in weight at the end of the experiment compared to the weight at the beginning of the experiment.

.....

.....

Explain in your own words, why the weight of the soft wood sample is different compared to the hard wood sample after the experiment.

.....

.....

Your comments on the experiment (briefly justify the difficulty and clarity of the learning task):

.....

.....

In each row of the table mark one of the emoticons with an (**x**) based on your understanding of the task and how you liked the experiment.

How did I understand the lesson? How was it to work out the task?	☺ very well	😐 good	☹ I need to improve
1. I know the reason why soft wood is lighter (weights less) than hard wood.	( )	( )	( )
2. I understood that soft wood and hard wood have different water absorption capacity.	( )	( )	( )
3. I can name the property of wood that causes soft or hard wood to gain weight when immersed in water.	( )	( )	( )
4. I understood the task, the experiment was illustrative, and I found it interesting.	( )	( )	( )

3 Research strategy

3.1 Definition of the research problem

In the subject of Technique in lower secondary education, teaching in the cognitive domain with use of the traditional teaching concept continues to prevail. The teacher presents existing knowledge and information to the student, justifies, reasons and emphasises, what is most relevant in the curriculum and tries to use appropriate tools if available.

Students listens and observe the teacher, write down notes from the blackboard and/or the textbook (if available), imitate the teacher and apply the method of observation. Students try to perceive, understand, remember and consolidate the learning content by problem solving. Many teachers focus only on the lower levels of learning, especially memorising of information, when assessing student's performance. There is a predominance of memory learning and mechanical reproduction of mostly retained knowledge, which often leads to a one-sided overloading of students with unreasonable demands on memory performance by the teacher. Students' personality development is suppressed. In general, it can be said that learning is passive and repetitive.

The subject of Technique has a practical focus, where students acquire and develop knowledge, practical skills, and habits in various areas of technique. The curriculum content enables students to tackle different problem-solving, technically oriented tasks, in which they apply knowledge gained from other subjects, particularly natural sciences. The content of the curriculum allows teachers, if the teaching process is properly organised, to implement a research-oriented way of learning and to develop students' technical creativity and critical thinking.

In specialized articles, research-oriented learning is defined as a fundamental teaching activity that enables learning about the world. The aim of research-oriented education is to make the content of the curriculum more attractive and to activate students in the acquiring of knowledge and skills. Research-based learning appears to be an effective approach to learning (Misbah, M., Hamidah, I., Sriyati, S., & Samsudin, A., 2024; Kireš M. et al., 2016).

The introduction of innovative activating methods in the teaching of students should also be reflected in the way students are assessed during lessons. Traditional assessment, which favours summative assessment, results in distancing the knowledge needed for real life from school knowledge, as students do not apply it in real situations. Knowledge serves only to get a grade for students (Semb, G. B., & Ellis, J. A.,1994).

On the contrary, formative assessment and self-assessment of students' performance in the cognitive domain should be at the forefront. Students should be systematically guided to evaluate their own performance in order to receive immediate feedback on the learning process already during the lesson. This leads to students' understanding of where they are still deficient and in which area they need to improve.

This highlights a learning approach that is primarily based on a thoughtful, systematic, and creative method by the teacher, who is able to fully implement the research-oriented model of education. The teacher should be able to design experimental learning tasks that are problem-based and actively involve the students and their classmates in the process of performance assessment. Thus, the teacher also assesses the students' learning process in the context of the development of their personality and key competences.

The above approach of the teacher is not common in today's primary school, rather it is a rare phenomenon. It is our endeavour to try to propose such a research-oriented model of

education, which will include the application of formative assessment of student performance through a self-assessment record sheet.

In context of the problem, we will look for answers to the questions:

1. Are the proposed experiments suitable for supporting the research-oriented model of learning in the selected content of the curriculum in teaching the subject of Technique with the application of formative assessment of students?
2. Is a self-assessment record sheet suitably designed in order for students to be able to express their views through self-assessment of acquired knowledge and understanding of the learning content?

3.2 Objectives, tasks and hypotheses of the research

The main objectives of the research include:

a) to find out the viewpoints of qualified teachers teaching the subject of Technique in primary schools on a designed workbook, in which worksheets with experiments on the properties of technical materials are proposed,
b) solution of selected worksheets (implementation of experiments) by teachers in the teaching process in the subject of Technique in the 6th grade of primary school,
c) to find out, based on the completed self-assessment record sheets, the feedback from students to what extent they understood and mastered the learning content in cognitive domain by means of the implemented experiments.

The main objectives of the research resulted in the following tasks:

1. Study and analysis of domestic and foreign literature focused on the issue of knowledge testing and assessment of students (summative and formative assessment).
2. Study and analysis of domestic and foreign literature with a focus on research-oriented teaching in primary school and implementation of experiments in school practice.
3. Analysis of the Educational Standard of the subject of Technique and selected content of the curriculum of the thematic unit Technical materials and working procedures of their processing included in the 6th grade of primary school, with a main focus on the performance standard.
4. To design and produce a set of worksheets with experiments as a tool for formative assessment of students.
5. To design and produce a self-assessment record sheet for the student, in which he/she records opinions and views on the experiment and thus provides feedback to himself/herself and to the teacher on how well he/she has understood and mastered the learning content.
6. To develop methodological tool for teachers.
7. To design a questionnaire for teachers, in order to find out their opinions on the workbook for the subject of Technique with exemplification tasks for students in the 6th year of lower secondary education.

8. Implementation of research in selected fully organised primary schools in selected regions of Slovakia.
9. Evaluation and interpretation of research results based on quantitative and qualitative analysis.

The research objectives and resulting research tasks were decisive in forming the hypotheses of the pedagogical research, which were tested in the implementation of the research. As the project activity focuses on the possibilities of effective application of the research-oriented model of education in the subject of Technique, we set the main hypothesis as follows:
H: Solving the designed experiments in the workbook will statistically significantly support the research-oriented model of education in the subject of Technique.

In order to clearly verify the main hypothesis quantitatively and qualitatively, we have formulated the following working hypotheses:
H1: Solving the designed experiments will statistically significantly affect the level of students' understanding of the curriculum.
H2: Solving the designed experiments will statistically significantly affect the level of students' mastering of the curriculum.

3.3 Methods used in the research

The choice of research methods used during the research was influenced by the main research objective. To test the validity of the main hypothesis *H* and to test the working hypotheses *H1* and *H2*, we chose the following research methodology. The basic method in the preparatory part of the scientific research was the literature method. Its essence was the study of relevant literature, sorting and processing of information.
Another research method was the questionnaire method. We designed a non-standardized questionnaire, which was addressed to teachers of the subject of Technique in lower secondary education. The aim of the questionnaire was to find out opinions of qualified teachers of the subject of Technique on the proposed Workbook with exemplification tasks. The questionnaire with 13 questions includes closed questions, semi-closed questions and open questions, where the respondents formed their answers.
We also used mathematical statistic methods to evaluate the research results. For statistical verification of main hypothesis *H* and working hypotheses *H1* and *H2* we used χ^2- goodness-of-fit test, suitable for statistical detection of significance of differences and testing the hypothesis of dispersion of normal distribution (Markechová, Tirpáková, Stehlíková, 2011).
In χ^2 – goodness-of fit test it is necessary to formulate the null and alternative hypotheses. The null hypothesis (denoted by H_0) is assumption that there is no relationship (association, difference, etc.) between observed phenomena. Alternative hypothesis (denoted by H_A) on the contrary is assumption that there is a relationship between the observed phenomena.
To process the research results, we used the online website of statistical software VassarStats.

3.4 Research sample

The subjects of the research were students of 6th grade of fully organized primary schools. The following representative characteristics were required to include a school in the research:

1. Fully organised state primary school with teaching language Slovak, where the subject of Technique was taught in accordance with the current Educational Standard.
2. The subject of Technique was taught by a qualified teacher (apprenticeship in technical education, basics of technique, or basics of industrial production, extended study of the subject of Technique) with the required teaching experience.
3. The management of the primary school consented to conduct the research at the school.
4. Teachers teaching the subject of Technique conducted the lessons in a specialized technical classroom.
5. The primary school was equipped with one or two specialized technical classrooms for teaching the subject of Technique.

The research involved 18 primary schools from different regions of Slovakia. These were primary schools in the Prešov, Banská Bystrica, Trenčín, Trnava, Nitra and Bratislava regions. 25 teachers (13 women and 12 men) and 573 students of the 6th grade of primary schools took part in the research. The primary school teachers could decide which of the 17 experiments to carry out with their students. The research in primary schools was carried out in March-May 2024 after covering the curriculum in the given thematic unit during the school year 2023/2024. The formative assessment tool for students was self-assessment record sheets, which were included in the worksheets.

4 Analysis and interpretation of research results

4.1 Analysis of selected questionnaire items

The purpose of the proposed questionnaire was to find out the opinions of the respondents on the proposed Workbook with exemplification tasks. Since the scope of this article is limited, attention is paid to the analysis of only selected items from the questionnaire. One of the items was to find out the respondents' opinion on the contribution/non-contribution of the workbook for the support of teaching in the subject of Technique. On the basis of the answers, we note that all 25 respondents (13 women and 12 men) answered unanimously that the presented workbook will support teaching of the subject of Technique and contains a number of compact, research-oriented topics and tasks with direct focus on the curriculum contained in the thematic unit Technical materials and working methods of their processing (6th grade of primary school), which is part of the Educational Standard of the subject of Technique. In the next item, we asked respondents whether the structure of the individual worksheets was suitably designed. The results of the responses are presented in Table nr. 1.

As can be seen in table nr. 1, all respondents answered unanimously that the proposed structure of the individual worksheets for students is suitable.

Among the statements of the respondents, we select the following:

- I appreciate the structure of worksheets - introduction to the problem, the setup, solving procedure - experiment, followed by verification of the solved problem and self-reflection,
- the tasks are clear and understandable, considering the age of students, I like the summary at the beginning of worksheet and the form of feedback after each experiment,
- it makes it easier for the student to learn the terminology and it contributes to a better understanding of the learning content,
- the work procedure is comprehensive, the task is clear, and the student knows what to do.

Response	Sex				Length of teaching experience in years									
	Woman		Man		Up to 5		6-10		11-20		21-30		Over 31	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Suitable	13	52	12	48	3	12	2	8	7	28	4	16	9	36
Unsuitable	-	-	-	-	-	-	-	-	-	-	-	-	-	-
∑	13	52	12	48	3	12	2	8	7	28	4	16	9	36

Table 1: Suitability of the structure of worksheets.

These justifications also reflect the fact that the workbook has its positives and is becoming a suitable teaching tool in the teaching of the subject of Technique based on the opinions of the respondents, who are qualified teachers of the subject with different teaching experience.

Each worksheet includes a student's self-assessment record sheet, in which he/she records his/her opinions and views on the experiment and thus provides feedback to himself/herself and to the teacher on how well he/she has understood and mastered the learning content. The answers of the respondents to the designed recording sheet are presented in Figure nr. 1.

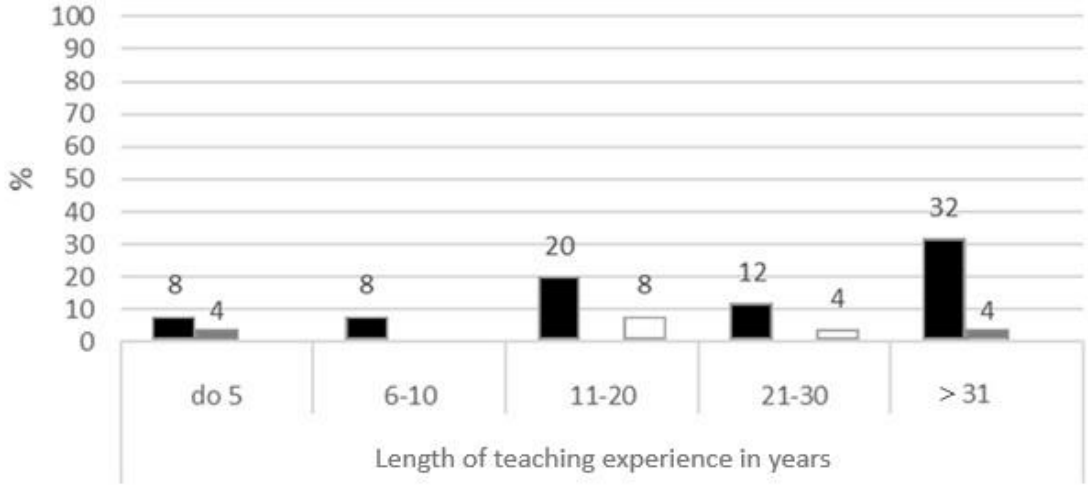

Figure 1: Graphic illustration of the responses.

Explanatory notes:

- Self-assessment is important, clear, concise and motivating
- Reformulation of the assessment
- Self-assessment may be optimistic and does not reflect reality

We have analysed the answers according to the teaching experience gained. The largest group was made up of men and women respondents in parity, who rated the student self-assessment record sheet very positively. They stated that the self-assessment was important, clear, concise as well as motivating.

The evaluation of the item shows that the design of the student's self-assessment record sheet and its integration in the worksheet is suitable and can be expected to provide an objective and self-critical assessment of the student's performance within the completion of the worksheet, a specific experiment focused on a property of a technical material.

In the next item, we asked for respondents' views on the use of worksheets in the teaching of the subject of Technique. The evaluation of the answers is presented in table nr. 2.

Response	Sex				Length of teaching experience in years									
	Woman		Man		Up to 5		6-10		11-20		21-30		Over 31	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Áno	13	52	12	48	3	12	2	8	7	28	4	16	9	36
Nie	-	-	-	-	-	-	-	-	-	-	-	-	-	-
∑	13	52	12	48	3	12	2	8	7	28	4	16	9	36

Table 2: Use of worksheets in the teaching process.

As can be seen in table nr. 2, all respondents showed interest in the use of worksheets in the subject of Technique and thus we can conclude that the workbook has its place in teaching process and can become an important methodological tool allowing the teacher to work with the students and thus promote the research-oriented model of education. At the same time, the teacher can use the student's self-assessment record sheet and thus apply the student's self-assessment, which develops another competence of the student's personality.

4.2 Verification of working hypotheses

Based on the analysis of the worksheets completed by the students, we interpret the results which are related to the verification of the working hypotheses and the main hypothesis.

Verification of hypothesis *H1* - Solving the designed experiments will statistically significantly affect the level of students' understanding of the curriculum.

Hypothesis *H1* was verified by evaluating the students' answers to the following questions in the self-assessment recording sheets included in the worksheet:

- I understood how ....,
- I can name the property .....

We have determined working hypotheses $H1_1$ and $H1_2$:

- $H1_1$ Solving the designed experiments will statistically significantly affect the level of students' understanding of the curriculum.
- $H1_2$ Solving the designed experiments will statistically significantly affect the ability of students to name the phenomena.

The statistical method of χ^2 - goodness-of-fit test was verified at significance level = 0.05 and for k = 2. We explored if the empirical (observed) frequencies were statistically significantly different from the expected (theoretical) frequencies consistent with hypothesis $H1_1$.

We first verified the level of understanding. We formulated null and alternative statistical hypotheses:

Null hypothesis $H1_{10}$*:* The frequencies of the formative assessment of students in terms of level of understanding are the same.

Alternative hypothesis $H1_{1A}$*:* The frequencies of the formative assessment of students in terms of level of understanding are different.

By entering the values obtained from the evaluation of the self-assessment record sheets into the statistical software, we obtained the values shown in table nr. 3. The statistical software calculated the critical value of the test criterion $\chi^2_{0,05}$ (2) = 362.05. In the statistical tables, for a significance level of α = 0.05 and k =2, the critical value is given as 5.991. Since the calculated value of 362.05 $>$ 5.991, we reject the null hypothesis H_0. The software also calculated a numerical P-value (P = $<$ .0001), which is used in statistical hypothesis testing. If the statistical package is tested using the null hypothesis H_0 at the significance level α and by using the χ^2 - goodness-of-fit test, if the P - value is less than the significance level α, we reject the null hypothesis H_0. In our case, we set the significance level α = 0.05, i.e., we reject the null hypothesis, and it is true that the frequencies of formative assessment of students in terms of level of understanding are different.

Cate-gory	Observed Frequency	Expected Frequency	Expected Proportion	Percentage Deviation	Standardized Residuals
A	395	191	0.33333333	+106.81%	+14.76
B	147	191	0.33333333	-23.04%	-3.18
C	31	191	0.33333333	-83.77%	-11.58
D				----	----
E				----	----
F				----	----
G				----	----
H				----	----

Reset Calculate

[Note that for df=1, the calculated value of chi-square is corrected for continuity.]		[For df=1, this is the uncorrected value of chi-square.]
chi-square =	362.05	
df =	2	[P is non-directional]
P =	<.0001	

Table 3: Calculation of test criterion χ^2 for the level of understanding of the curriculum.

We used the same statistical method to test how students assessed their ability to name the phenomena they explored in individual experiments. To verify this, we formulated the following statistical hypotheses:

Null hypothesis $H1_{20}$*:* The frequencies of the formative assessment of students' ability to name phenomena are the same.

Alternative hypothesis $H1_{2A}$*:* The frequencies of the formative assessment of students' ability to name phenomena are different.

By entering the values obtained from the evaluation of the self-assessment record sheets into the statistical software, we obtained the values shown in table nr. 4.

Cate-gory	Observed Frequency	Expected Frequency	Expected Proportion	Percentage Deviation	Standardized Residuals
A	282	191	0.33333333	+47.64%	+6.58
B	219	191	0.33333333	+14.66%	+2.03
C	72	191	0.33333333	-62.3%	-8.61
D				----	----
E				----	----
F				----	----
G				----	----
H				----	----

Reset Calculate

[Note that for df=1, the calculated value of chi-square is corrected for continuity.]		[For df=1, this is the uncorrected value of chi-square.]
chi-square =	121.6	
df =	2	[P is non-directional]
P =	<.0001	

Table 4: Calculation of test criterion χ^2 for the ability to name phenomena.

Due to calculated value $121.6 > 5.991$, we reject the null hypothesis H_0. Similarly, the null hypothesis H_0 can be rejected because the numerical *P*-value ($P = < .0001$) is much less than the significance level $\alpha = 0.05$ set by us. The alternative hypothesis H_{2A} is valid - frequencies of the formative assessment of students' ability to name phenomena are different.

Statistical testing of both working hypotheses $H1_1$ and $H1_2$, used to verify hypothesis H1, demonstrated that we have to reject the null hypotheses for both working hypotheses, i.e., we accept the hypothesis H1, and it is true that solving the designed experiments will statistically significantly affect the level of students' understanding of the curriculum.

Identically, we also verified working hypothesis H2 and came to the result, that we accept hypothesis H2, i.e. solving the designed experiments will statistically significantly affect the level of students' mastering of the curriculum.

Since we have statistically confirmed the working hypothesis H1 and working hypothesis H2, we conclude that the main hypothesis H formulated as follows has also been confirmed:

Solving the designed experiments in the workbook will statistically significantly support the research-oriented model of education in the subject of Technique.

5 Conclusion

The quantitative and qualitative analysis of the individual items of the questionnaire show that we have found the answers to our questions, and we can therefore conclude that:

1. Experiments to support a research-oriented model of learning in selected curriculum of the subject of Technique with the application of formative assessment of students are suitably designed for students in the 6th grade of primary schools.
2. A self-assessment record sheet, in which students can express their opinion in the form of a self-assessment of the acquired knowledge and understanding of the curriculum, is suitably designed for students in the 6th grade of primary schools.

It follows from above that the workbook reflects the content, but especially the performance standard in given thematic unit. It can be viewed as a suitable methodology tool in teaching the subject of Technique, it is expertly designed, well produced and research oriented.
The designed and produced set of worksheets served us as a didactic tool for the application of formative assessment of students in course of the repetition and consolidation of the curriculum. On the basis of the research results, we can conclude that the didactic tool used had a statistically significant impact on the level of students' understanding and mastery of the knowledge from the given topic.
The research-oriented model of learning in the subject of Technique has all the prerequisites to make the learning attractive, motivating and experiential for the students. It includes student activities that make a significant contribution to the fulfilment of the objectives of the subject. By exploring and discovering new facts in the classroom, students learn, among other things, to solve problems and to think creatively and to develop the skills necessary for 21st century - critical thinking, teamwork, personal responsibility, decision-making, the ability to learn, etc.

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